THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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THE METAL INDUSTRY AND The ALUMINUM WORLD AND The BRASS FOUNDER and FINISHER AND ELECTRO PLATERS REVIEW

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CONTENTS.

	PAGE.
Editorial	1
Recent Tests of Alloys	3
Large Bronze Casting	4
The Modern Way of Producing Verde Antique	5
Potash Solution for Cleaning	7
Electro-Plating Designs on Glass	7
New Chucking Machine for Brass Goods	8
The Birmingham Brass Trade	9
An Improved Form of Table Knife	10
Blanching the Silver-Copper Alloys	11
Correspondence Department	12
Light Yellow Brass Castings	13
Japanese White Metal	13
Aluminum Instruments of Precision	13
Patents	14
Trade News	15

ANNOUNCEMENT.

With this issue, THE METAL INDUSTRY in its present form enters upon its third year. January, 1903, however, does not represent the earliest date of its connection with the non-ferrous metal industry, inasmuch as by the purchase and incorporation of the *Brass Founder and Finisher* its connection with the brass industry dates back to March, 1902, while by the incorporation of the *Aluminum World and Brass and Copper Industries* it dates back to October, 1894, as an aluminum, brass and copper journal.

Judging from the ever increasing subscription and advertising patronage, we are justified in saying that the journal has established for itself a recognized and important place in trade journalism, not alone in this country, but all over the world, which latter fact is proven by the number of our foreign subscribers. In its chosen field, it has endeavored to faithfully chronicle the advances in the art and, in its various departments, to point the way to progress.

It is our intention, in the coming year 1905, to make THE METAL INDUSTRY still more instructive and interesting than in the past, and still more truly representative of all the branches of the great industry which it serves. To this end we have made arrangements with a number of leading specialists in their respective branches, in order to fulfill this program and to keep our readers constantly in touch with the progress made throughout the entire metal world.

In consistently following out this policy, there will be no danger that the subjects dealt with will be expository of the views of one man only; on the contrary, the articles will represent a true picture of the tendencies, along which progress in the various branches of the art is manifesting itself.

It is, of course, a well known fact that THE METAL INDUSTRY is entirely independent of any corporation or firm in the respective trades with which it concerns itself. Its sole aim is to further the progress of the art and to keep its readers abreast of the times.

We thank our subscribers and advertisers for their past patronage and assure them that we will spare no efforts to give them even better returns in the future.

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THE VALUE OF DISCUSSION.

Within recent years a notable change of attitude has taken place on the part of individual manufacturers and corporations in various branches of industry, regarding the publication of information which had been gained by them in their works. The days, when the slightest improvements in processes or apparatus were jealously guarded as important secrets, seem to be definitely over and it begins at last to dawn on the majority of the people concerned that they will derive more benefit from an intelligent discussion of their work, its limitations and possible avenues of improvement, than they will from keeping it secret.

It has been claimed, and probably with a great deal of truth, that the progress made during recent years in the iron and steel industry in this country was due in no small measure to the willingness of each manufacturer to describe and discuss his own processes of manufacture, and in turn to benefit by the criticisms and remarks of his co-workers in the field. Evidences of the thoroughness and the liberal spirit in which the discussion of these various subjects was carried on, are to be found in abundance in the volumes of the transactions of the American Institute of Mining Engineers for the past twenty years or so.

Another instance of similar character was furnished quite recently by a paper read before the British Institution of Mining and Metallurgy, which dealt with some detailed experiments carried out relative to the finding of a method for the most economical treatment of ores containing gold and silver from a large mine in Mexico. In this case the author stated that ten years ago the results, obtained with a considerable expenditure of time and money, would not have been published, but that the directors of the corporation had decided to make them public, so as to throw them open for discussion and thus being able to arrive at a more satisfactory conclusion concerning some points which appeared debatable. The discussion of this particular paper was quite extended and lively and no doubt justified the expectation of the directors of the corporation in question.

The non-ferrous metal industry seems to be one of the notable exceptions concerning the inclination of concerns engaged in it to publish information as to their methods of working. Many establishments still seem to consider that they are in possession of a host of secrets and that their method of production is the only right one and cannot be improved. Perhaps it is and perhaps it is not, with chances in favor of the latter, the more secrets, etc., are locked up in the brain of the foreman, with the awful importance of which he has been able to impress the guiding spirits of the concern.

The above remarks are not intended to imply that there are no manufacturing secrets, or that there are no methods which are legitimately kept secret. Nobody would expect a manufacturer to publish anything for the benefit of his competitors, which he has perfected after the expenditure of a great deal of time and capital. But there is no denying that the non-ferrous metal industry would be benefited by an intelligent discussion of a number of problems, as it is certainly second to no other industry in the intricacy of its problems.

THE METAL INDUSTRY, representing as it does the whole non-ferrous metal industry and having its progress thoroughly at heart, always has endeavored to do its share towards the furtherance of the best interests of this great industry. As it is the recognized representative of the industry, it is eminently fit to be the medium for carrying on discussion on the lines suggested. Its columns always have been and always will in the future be opened cheerfully to any of its readers who desire to comment on any practical problem in which they may be interested. If they will avail themselves of this opportunity, there is no reason why the beneficial results, attendant upon similar procdure n other lines of business, should not be forthcoming in this instance.

WATER FOR PLATING PURPOSES.

The question of an adequate supply of pure water for plating purposes is one of considerable importance, as far as its bearing upon the results of the plating operation is concerned, but is not infrequently apt to be overlooked in deciding upon the location of a new shop. Many a plater probably has experienced trouble with his work, which he attributed to other causes, when they were probably due to the water he used.

On account of the delicate nature of the electroplating operations only the very best and purest water should be used, such as distilled or rain water. The latter should, however, not be collected from a metallic roof and the first portion which contains a considerable amount of dust, should be rejected or filtered. River water, especially from places where large manufacturing establishments are located in the neighborhood, is frequently entirely unsuited for plating on account of the large amount of organic impurities, with which it is contaminated. Such organic matter is apt to produce chemical precipitates in some plating solutions which give rise to a good deal of trouble by settling upon the objects to be plated and causing spotted or blistery deposits.

Hard waters, that is, waters which contain a considerable amount of lime salts, are also unsuitable for plating purposes. As these salts are conductors of the current it is unavoidable that a certain part of them is also decomposed by the passage of the current, especially of the tension between the electrodes goes above a certain voltage. An insoluble compound of lime is then formed at the kathode which is liable to cause the metallic deposit to scale off and by its covering the active surface of the kathode interferes with the passage of the current. More resistance is thus introduced into the circuit, and the consumption of electrical energy is greater than it would be normally. For these reasons such waters should be scrupulously avoided.

If it is at all possible, arrangements should be made to obtain distilled water by the condensation of steam.

RECENT TESTS OF ALLOYS.

By Henry Souther.*

It is truly surprising to note the enormous differences existing in the mechanical properties as well as in the chemical composition of the various metallic alloys found in the market. In many cases, however, the chemical composition as shown by analysis furnishes no clue to the variations which are liable to occur in the physical characteristics, such as tensile strength and toughness, inasmuch as the analysis may show two alloys of widely varying mechanical properties to closely resemble each other as far as the amount of the various chemical elements contained in them is concerned. Evidently in such cases the variation in the physical characteristics are not caused by the different influence exerted by the chemical components but by other conditions having to do with the melting and casting of the metals.

One great chance of trouble and faulty results has, of course, always to be guarded against, and that is the presence of oxygen and other gases and of oxides in the melt. Dirt itself may get into the molten metal and cause serious trouble by destroying the homogeneous nature of the product and disastrously influencing its strength. However, if contamination of the melt from these sources and their consequent attending evils are eliminated, there is still a cause left, which is at the bottom of a great many of the inexplicable results in regard to the variation of mechanical characteristics. This cause is the wide variation existing in the casting temperature, with the possibility of producing large or small crystals or segregated metals, thus resulting in an entire absence of homogeneity. In this connection reference may be made to an article by Waterhouse in the December number of The Metal Industry, in which the variations in the strength due to this cause are shown very forcibly.

In the following the writer intends to give a few figures of tests made in his laboratory during the last few months, which fairly illustrate what range of toughness, strength and analysis is found in various alloys on the market. The results also show how broad are the variations obtained by different founders pouring approximately the same alloys.

The following are the results obtained from test bars from two separate concerns aiming at a metal of the following composition:

Copper, 88%; tin, 10%; zinc, 2%.

The following are the physical results obtained:

	No. 1.	No. 2.
Dimensions	1.01" x .339"	1.499" x .321"
Elastic limit per sq. in.	22,100 lbs.	21,600 lbs.
Maximum strength per sq. in.	34,900 lbs.	32,000 lbs.
Elongation in 2"	13%	8.5%
Reduction of area	13.7%	None

The chemical analysis showed the following composition:

	No. 1.	No. 2.
Copper	91.00%	88.67%
Tin	8.98%	9.32%
Lead	....	.20%
Zinc	....	1.80%
Phosphorus	.02%	.01%

The agreement in strength, that is, elastic limit and maximum strength, is first rate, but the agreement in toughness is not at all good, No. 1 having a good elongation and reduction of area, whereas No. 2 has a fair elongation and no reduction of area. It is also seen that the two manufacturers did not arrive at the same alloy after all. One of them probably used scrap containing elements about which he knew nothing. The other one apparently burned his zinc all off, none being found in the final alloy.

The next alloy is one where an attempt was made apparently to get a manganese bronze of unusual strength. Success was not very marked, as shown by the following test and analysis:

Physical Results:

Dimensions	1.51" x 3.50"
Elastic limit, per sq. in.	12,000 lbs.
Maximum strength, per sq. in.	19,400 lbs.
Elongation in 2"	10%
Reduction of area	None

Chemical results: Copper, 72.99%; iron, 1.50%; zinc, 24.20%; phosphorus, .01%; manganese, 1.30%.

There was plenty of manganese present in the finished alloy, but that did not seem to bring the required result. Something was lacking; the reduction of area was nothing and the elongation very low, as well as the strength characteristics.

In direct contrast to this is a manganese bronze of another make, showing a wonderfully strong and tough alloy. As very often happens, however, no manganese appears in the finished product and the analysis gives no evidence of any having been used. The buyer must take that on faith. Something was used, however, to give unusually good results and, according to the notion of the writer, it was the brains of the manufacturer quite as much as the composition. Every precaution must have been taken to keep the metal clean, pour it at the right temperature and cool it properly.

The physical results attained were as follows:

Dimensions	1.00" x .315"
Elastic limit per sq. in.	20,950 lbs.
Elongation in 2"	40.00%
Maximum strength per sq. in.	70,150 lbs.
Reduction of area	43.2%

The chemical analysis showed:

Copper	59.9 %
Tin	1.1 %
Iron	1.48%
Phosphorus	Trace
Manganese	None
Zinc	37.5 %

The following is the physical test of an aluminum bronze for which, unfortunately, there is no analysis. The physical characteristics are not particularly good, the test showing only a low amount of toughness:

Physical Results:

Dimensions	.500" round
Elastic limit per sq. in.	20,400 lbs.
Maximum strength per sq in.	24,500 lbs.
Elongation in 2"	3.5 %
Reduction of area	3.07%

The above test of aluminum bronze does not fairly represent what a proper alloy of copper and aluminum is. A strength approaching 50,000 to 60,000 pounds per square inch in a cast condition is not unusual.

The next are the physical results from the tension test made on a piece of phosphor-bronze, as found in the market. This is strong and tough, again indicating that it

*President the Henry Souther Engineering Company.

came from the hands of a very reliable founder; the immense tensile strength, coupled with very great toughness, is shown by the reduction of area and elongation, and is very unusual.

Physical Results:

Dimensions	.500" round
Elastic limit per sq. in	27,000 lbs.
Maximum strength per sq. in	72,400 lbs.
Elongation in 2"	23.00%
Reduction of area	21.94%

The strength of cast aluminum is fairly represented by the following figures:

Physical Results:

Dimensions	.500" round
Elastic limit per sq. in	Not measurable
Maximum strength per sq. in	16,300 lbs.
Elongation in 2"	None
Reduction of area	None

This is about all that can be expected of cast aluminum. Less strength is obtained rather than more, as a rule.

An unusual specimen of cast metal is represented by the following alloy:

Physical Results:

Dimensions	.998" round
Elastic limit per sq. in	None
Maximum strength per sq. in	29,500 lbs.
Elongation in 2"	None
Reduction of area	None

Chemical Results:

Copper	66%
Zinc	25%
Nickel	9%

This alloy is brittle; not very strong, and, altogether, not particularly desirable from the results of this test. The elastic limit was not obtainable, and if it existed it could have been located only by the most careful instrumental measurement, not usual in making such tests.

The possibilities of wrought alloys are very great and magnificent results are obtained in filling the requirements of the Government for copper, Tobin bronze and Naval brass.

Some wrought copper results are given in the following, the analysis being almost absolutely pure copper in every case:

Physical Results:

	No. 1.	No. 2.	No. 3.
Dimension	1.50" x .079"	1.495" x .250"	1.495" x .221"
E. L. per sq. in.	5,900 lbs.	9,890 lbs.	
M. S. per sq. in.	31,080 lbs.	30,800 lbs.	33,300 lbs.
Elongation in 8"	24.5 %	43.5%	3.87%

The reduction of area of these copper strips is not obtainable, because the test specimen draws down to a ragged knife edge not measurable with any respectable degree of accuracy.

In No. 3 is a good illustration of what hard drawing can be made to do. The increase of strength is considerable, but the reduction of toughness as shown by the elongation is tremendous. In other words, if copper is to be strengthened very much by cold working, elongation must be sacrificed. This will be noted by the comparison with the other two samples.

A fair sample of the characteristics of Naval brass and of Tobin bronze is shown by the following, both of these metals being wrought and having been given a definite degree of hardness or strength to meet certain Government requirements:

Physical Results:

Naval Brass.	
Dimension	1.307" round
Elastic limit per sq. in	31,100 lbs.
Maximum strength per sq. in	64,500 lbs.
Elongation in 8"	21.5%
Reduction of area	18.8%
Tobin Bronze.	
Dimension	1.124" round
Elastic limit per sq. in	29,000 lbs.
Maximum strength per sq. in	58,500 lbs.
Elongation in 8"	25.75%
Reduction of area	28.13%

An attempt was evidently made in the following specimen to get unusual strength, and the attempt met with success, as shown by the physical results, the mixture attempted evidently being 90 per cent. copper and 10 per cent. tin.

Physical Results:

Dimension	1.50" x .063"
Elastic limit per sq. in	46,000 lbs.
Maximum strength per sq. in	90,000 lbs.
Elongation in 8"	8%
Reduction of area	Not m'sur'd

Chemical Results:

Copper	90.00%
Tin	9.89%
Lead	.10%
Phosphorus	.01%

The reduction of area in this sample was practically zero. Again it is apparent that when excessive strength is obtained by cold working something has to be sacrificed in the way of toughness.

In testing cast alloyed specimens it is noticed that a very large percentage of them show more or less flaws on the fractured surface. This, of course, vitiates the test.

With the wrought alloys such flaws very rarely occur, the only difficulty being in the fact that they have to be "necked" down in order to hold them successfully up to their breaking point. A bar of uniform section throughout usually pulls through the jaws, no matter how strong they hold. The metal flows easily, and is of a slippery nature, behaving entirely different in the jaws, as compared with steel, which never slips.

A LARGE BRONZE CASTING.

The Allen Fire Department Supply Company, of Providence, R. I., recently made what they believe to be the largest bronze casting ever cast in Rhode Island. The casting weighed 1,925 pounds, was 30½ inches high, 44 inches in diameter and 2 inches thick. The mold was made with a sweep-up pattern, requiring seven laps of the pattern to complete the mold. The composition of the alloy was 84 per cent. copper, 6 per cent. tin, 3 per cent. lead, 7 per cent. zinc. The casting was made in a deep pit, and was used for a pump lining. It has been the custom formerly to manufacture the lining out of sheet brass, but this time a cast bronze lining was ordered. The Allen Company were successful in getting a sound casting at the first pouring.

THE MODERN WAY OF PRODUCING VERDE ANTIQUE, ROMAN BRONZE AND PATINAS ON THE SOFT METAL ALLOYS BY THE AID OF PIGMENTS.

By Charles H. Proctor.

The object of bronzing and coloring metals is mainly to beautify the exterior by imparting to it a coating or surface film of color. Copper is the metal par excellence, both in its natural and alloyed state in the form of brass or bronze, which lends itself most effectually to the production of beautiful bronze tints. This in a great measure is due to its red color, which may be altered into a great variety of tones by various solutions and colors. It is well known that articles of copper and its alloys acquire, after a long exposure to the action of the air or earth, beautiful brown or light and dark-green colors which considerably contribute to their handsome appearance. These colors are known as Verde antiques or patinas. It is the intention of the writer of this article to describe how these beautiful effects may be produced on the soft metal alloys, composed of lead and antimony or lead, tin and antimony. Many articles of ornament and use are made of combinations of these metals. Various shapes and configurations are produced by the aid of molds, wholly or in part, and soldered together to form beautiful designs in clock cases, ash receivers, statuettes, candelabras, etc., which may be beautified by electroplating and coloring.

I will first describe the method of producing the light and dark verde colors. The first operation consists in smoothing down with a scraping tool all seams left by the mold and to polish lightly on a hard rag wheel of from 8 to 12 inch diameter and 2 to 3 inch face at a speed of from 1,500 to 2,000 revolutions per minute, with sand buffing compound or tripoli. The articles are then cleaned in benzine as soon as possible and dried out in maple sawdust. They are then immersed for a moment in a hot solution of caustic soda (¼ pound to a gallon of water, with an addition of 1 or 2 ounces of strong ammonia water to each gallon), or a solution made up with 4 ounces kalye to a gallon of water and used near the boiling point. The latter solution will give the best results of the two, as it does not act on the soldered parts as rapidly as the caustic soda and cleans better. The articles are then washed in cold water, passed through a hydrochloric acid solution composed of 8 ounces of acid to each gallon of water, washed again and flashed in a warm cyanide of copper solution until completely covered with copper. This solution may consist of any good formula made up with cyanide, sodium carbonate, sodium bisulphite and carbonate of copper. Solutions of this description give the best results, owing to their high conductivity. The articles are taken from this bath, washed well and immersed in an acid copper bath consisting of 24 ounces of commercial sulphate of copper and 2 to 4 ounces of commercial sulphuric acid to each gallon of water, for from 15 minutes to half an hour, with medium current strength at 2 to 2½ volts. The solution is used cold, but not below 70 degrees, and will give a beautiful soft red copper deposit of sufficient thickness for most purposes of this description. The articles are then taken from this bath, washed thoroughly and immersed in a bath of potassium sulphide, consisting of 1 ounce to a gallon of water. This solution is used for dark verde and patina grounds and is applied cold. For light verde colors only ¼ ounce is used. The articles are immersed momentarily, washed and scratch brushed for relief work on soft brass wire scratch brushes, 4 to 6 inches diameter, such as are used on silver deposit work. This operation should produce a beautiful red color for light verde and darkish brown for dark verde. The articles are now washed, dried and lacquered with a French varnish lacquer consisting of one part French varnish and ½ part each of fusel oil and amyl acetate and dried with the aid of heat. They are then ready for the colors. Light verde colors should be a yellowish green and are made up from dry colors. They should consist of zinc white 4 parts, light chrome green 1 part, and chrome yellow ¼ part, dissolved in spirits of turpentine with an addition of a small quantity of turpentine copal varnish and mixed to the consistency of thin paint. They should be applied to the article with a fitch varnish brush as rapidly as possible, giving a straight stroke for figured work and a stipple motion for plain surfaces. The articles are then placed in the lacquering oven or other source of heat until they are dry, whcih will take only a few moments. As soon as they are cold they are brushed rapidly with a plater's hand

VERDE ANTIQUE FINISH ON AN IMPROVED MECHANICAL LAMP WHICH IS USED WITHOUT A CHIMNEY.

brush, using a small amount of bees' wax. This operation gives the soft luster to the color, which if applied correctly is a lusterless finish before waxing. If it is intended to show the copper in relief on the high grounds a soft rag is used, very slightly moistened with turpentine. This, with little rubbing, will remove the color wherever it is desired to show the copper in relief. Afterward these parts are gone over with a rag slightly moistened, with the lacquer used as a body, which brings out the copper and protects it. The articles are then again heated until they are dry.

The dark verde colors are produced in the same manner, only the color is made up as follows: 6 parts of zinc white, 2 parts of dark chrome green, ½ part

VERDE ANTIQUE FINISH ON A LAMP DESIGNED FOR THE ORIENT.

lampblack, ¼ part chrome yellow. This makes a rich dark green, which is mixed as in the preceding formula and applied and finished in the same manner.

The production of ancient verde or Egyptian green is carried out in the following manner. The finish should show black on relief parts and green in backgrounds. The articles are polished, cleaned, plated in the cyanide copper and the acid copper bath for ten or fifteen minutes as in the preceding formulas, treated with the solution, for dark verde until the blackish tone is produced, washed and dried without scratch brushing. A black body lacquer is used, which can be made by adding lampblack to French varnish and using the thinner mentioned before as a reducer, or any dead-black lacquer can be used. It is applied with a fitch varnish brush and dried with heat and should be allowed to stand for a couple of hours in order to harden. A thin color is then made up from light chrome green and turpentine and is applied rapidly with a ½ inch camel's hair brush and dried. Afterward the green is removed with a canton flannel rag moistened with turpentine, which operation will show up the blacks and greens. The articles are then dried with a good heat, which makes the finish hard and durable. This procedure gives the articles the appearance of great age and produces a rich finish.

Roman bronze is produced as follows: The articles are polished, cleaned and plated in the cyanide of copper and the acid copper baths, as in the preceding formulas, washed and plated directly in a brass solution for fifteen or twenty minutes. They are then removed, washed and scratch-brushed with a soft brass wire scratch brush, using a little powdered pumice stone on the article to give a brush brass effect. They are afterwards washed, dried and lacquered in the same manner as verde finishes. The color is made up from zinc white and turpentine, together with a small quantity of turpentine copal varnish and just sufficient light chrome green to give a light pea green tone to the color, the whole being mixed to the consistency of paint. The articles are allowed to cool after lacquering and the color is then applied as rapidly as possible with a fitch varnish brush, first with a straight stroke as in painting, and then with a stipple motion. They are dried by heat, which operation will last four or five minutes, and allowed to cool. The articles will have a dull white aspect, showing the brass almost through in very minute variegated patches. This is now toned down with the waxing brush, when a beautiful whitish green with a speckled appearance will appear. The relief parts are relieved here and there to show the brass, with a little dilute lacquer applied with a rag as before mentioned. Plain surfaces give the best results and the richest effects.

Pompeian bronze is produced in the same manner as the Royal bronze, but two greens are used and the color is solid without relief. The first color should be a bluish green, made up from zinc white, light chrome green and a very small amount of soluble blue. It is applied as for Roman bronze and afterwards dried and waxed. A whitish green, which may be the same as that used for Roman bronze, but rather more dilute, is now applied in irregular patches with a ½ inch camel's hair brush. This second color when dried and waxed gives the variegated tones much admired on solid bronze goods.

Patinas on copper are produced as follows: The articles are polished, cleaned and plated with copper as for dark verde colors, treated until a blue-black color is produced and dried and lacquered without scratch brushing. Any of the greens mentioned may be used, giving the straight and stipple effects when applying the color. The articles are then dried and waxed. If they are made up in relief the lacquer rag is used to remove the green from the high grounds, which operation will give the bronze green varying to the body greens. Care should be used not to use too much friction, as the copper tones should not as a rule show on this finish.

Antique brass showing a faint greenish color on the relieved parts is produced as follows: The articles are polished, cleaned and plated as for Roman bronze. They are scratch brushed and immersed in a dilute ammonia copper solution for a couple of seconds. The solution may be produced by saturating 26 per cent. ammonia water with carbonate of copper, using 3

parts of hot water to each part of ammonia copper used, and adding 2 to 3 ounces of sodium carbonate to each gallon of solution. The solution is used cold. The color will be a bronzish green, and is washed and relieved on the relief parts with pumice stone and a rag as evenly as possible on the smooth surfaces. It is then dried and lacquered with the varnish lacquer mentioned previously, to which is added a small amount of aniline nile green, dissolved in fusel oil. This operation will give to the relieved parts a greenish tone and to the background an olive green tone. The finish is very rich and is used on expensive lamps made from solid brass.

Various colors may be applied to soft metal alloys after plating or directly to the metal itself by mixing up dry colors with spirit copal varnish (made from gum copal and wood alcohol) using wood alcohol or a mixture of fusel oil and amyl acetate as a thinner. These colors when applied to statuary work are known as French bronzes.

Bronze powders of various shades may be used in connection with dry colors and the varnish mentioned. The iron reds produce royal reds, ochre and umber Barbedienne tones and a variety of other colors may be applied. These colors are dried and waxed, the second colors are mixed with turpentine and relieved as mentioned before. Many artistic effects can be produced according to the taste of the operator.

POTASH SOLUTION FOR CLEANING.

It is seldom that persons are found who complain about potash, but now and then some one appears who seems to think that there may be something better. He complains that it attacks the work and leaves it black. Those who do this have apparently not investigated the merits of potash nor its value as a cleaning material.

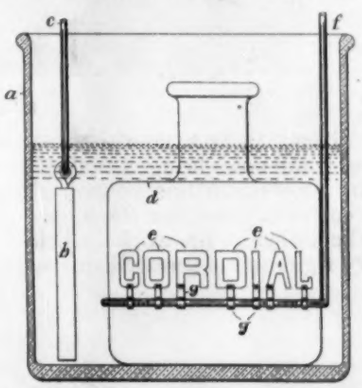
There are two things in electroplating which have to be avoided. They are grease and oxidation. Both are the plater's enemies and prevent the proper adhesion of the deposit. In order to remove the grease it is obvious that something must be used which will attack it. Of course benzine or similar solvent may be used, as all greases are readily soluble in the liquid, but such solvents are open to the objection that they only dissolve the major portion of the grease or oil and leave a thin film on its surface. This thin film is generally as bad as a thick one. Recourse must be had, then, to the alkalies of which potash and soda are the only ones which act in a way which is necessary. Washing soda (carbonate of soda) or pearlash (carbonate of potash) act on the grease to a certain extent, but not eagerly, and if the work is covered with much grease of a mineral nature it may take a long time to dissolve it. Really, the only alkalies which can be used are potash and soda. Now the question is which is the best.

A little experimenting on the part of the user will soon indicate that potash far surpasses soda in its power of dissolving grease, and not only attacks it more thoroughly and more quickly, but leaves the soap which is formed in a far better condition for the dissolving action of the water. This is what is desired, as there is no object of attacking the grease unless the resulting compound can be removed by means of the water.

Those who have trouble in the use of potash make the solution too strong, and if they will add more water it will soon be discovered that there is no better material for the purpose than potash. A great mistake is made in not obtaining the best, as common grades are liable to contain foreign substances which will stain the work. For instance, let us assume that sulphur is present in the potash. It will not take the plate long to realize that the work will quickly be discolored. The purest potash is by far the most economical.

ELECTROPLATING DESIGNS ON GLASS.

The following process is the invention of L. Blower and has been patented on November 15, 1904. The process consists essentially in fusing a mixture of pulverized metal or flux in the desired design upon the vitreous surface and electrodepositing the desired metal upon the conducting base thus produced. It is thus possible to use a base metal as the substratum, in cases where the electrodeposit has to be made of a more costly metal, as gold and silver. The metal which is to form the basis for electrodeposition is powdered and mixed with a siliceous or other suitable flux, which will adhere to the vitreous surface when fused. This mixture of metal and flux is mingled with a suitable medium such as silicate of potash and applied to the vitreous surface, which may be either glass or porcelain, in the desired design. The article having the vitreous surface is then fired, in order to fuse the composition in the design, during which process of firing the metal and the flux are melted and the latter unites with the vitreous surface in such a way as to leave a metallic surface exposed which is suitable to be used as an electric conductor. The article is then introduced into a suitable bath of the metal, which it is desired to plate upon the design, and the surface of the design is connected by suitable means with the negative pole of a source of current, the positive pole being connected with an anode of the metal to be plated out. An illustration of the apparatus as used for the formation of inscriptions



on glass bottles is given in the adjoining figure, where the method of connecting the various letters with the negative pole of the current is clearly shown. The feeders must be arranged so that they are securely in contact with the different portions of the design. As with an article of vitreous character the negative conductor is insulated where it touches the vitreous surface, it is simply clamped upon the article and bent in such a manner as to embrace it elastically, whereby the conductor is held in a fixed position with regard to the design and holds the feeders in contact with the letters. After the deposition is finished, the design may be polished, burnished, frosted or finished in any desired manner.

Zinc may be blackened by the use of chloride of antimony, dissolved in muriatic acid; using just enough for the purpose. Dilute the solution obtained with twenty parts of grain alcohol, and apply to the zinc with a brush or by dipping. The zinc may then be lacquered. If too strong in acid the solution will not work properly, and the coating will not adhere.

A NEW CHUCKING MACHINE FOR BRASS GOODS.

By W. J. Abate.

The machine, a view of which is given in Fig. 1, is designed for rapid boring, facing and tapping of the pipe ends of valves and cock bodies, boring and tapping union nuts, milling valve stems, boring and seating bibbs, threading shanks of bibbs or other articles of brass and iron. In fact, nearly 50 per cent. of the general brass work now being handled in the turret lathe may be finished in this new machine at about one-half the cost. In operation the tools are run in the spindle of the lathe. The work is held in a chuck which is very rigid and is screwed to the saddle of the lathe. This chuck is made so as to receive the regular jaws of an ordinary two-jaw chuck. A perspective drawing of the chuck is shown in Fig. 2. The chuck is operated by a lever handle at the top. In order to place a piece of work to be operated upon it into the chuck, it is only necessary to raise the lever, drop the work in the jaw and bring the lever down under a catch which holds it firmly in place. Elbows, tees, and all irregular pieces as well as round stock may be gripped in the chuck. The machines are being built and are for sale, being placed on the market by W. J. Abate, mechanical superintendent of the McRae & Roberts Company, Detroit.

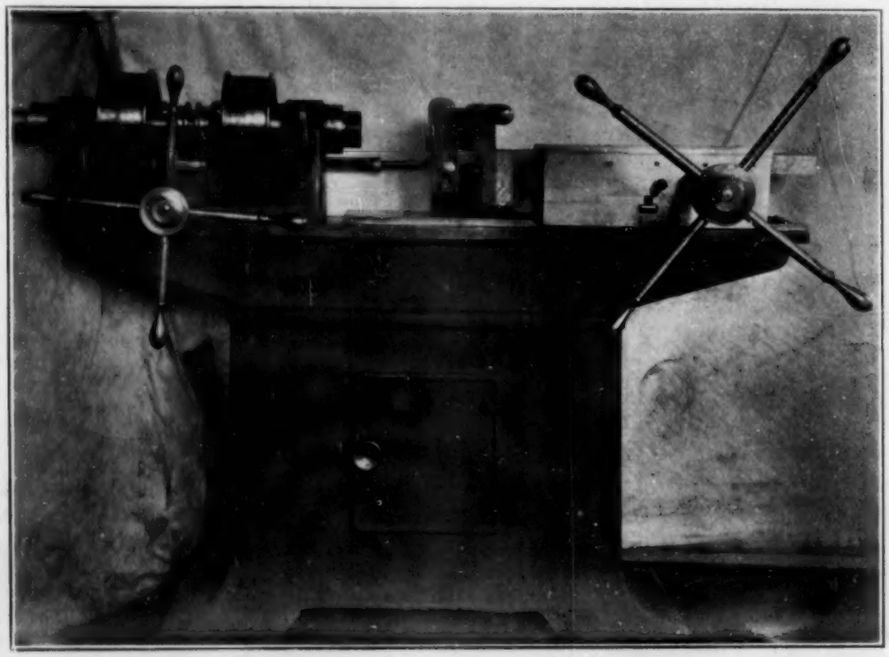


FIG. 1. THE COMPLETE MACHINE.

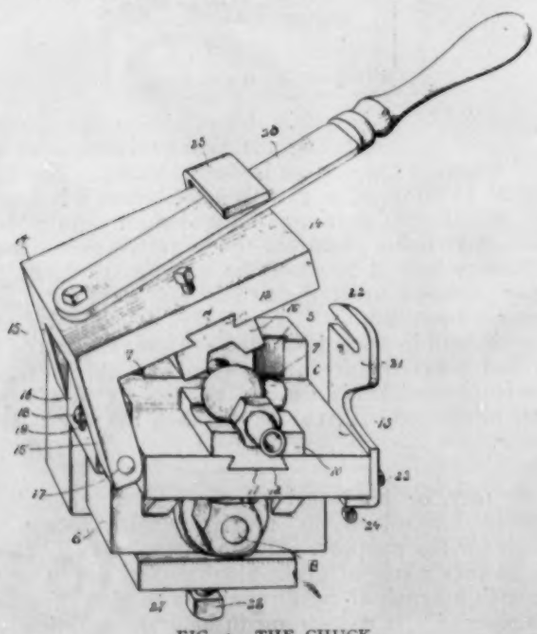


FIG. 2. THE CHUCK.

A new departure is the placing of a friction device on the spindle instead of the ordinary step cone. This friction device is operated by a pilot wheel at the left of the machine or it may be connected so as to work in conjunction with the saddle. This connection allows a piece of work to be threaded to a shoulder or a given distance, and automatically stops the die or tap or reverses the machine at the option of the operator. As there is nothing but the spindle of the machine reversed there is a great saving in power in this feature alone. By this arrangement the whole machine is entirely controlled by the pilot at the right hand. The machine being set for certain work the operator places a piece in the jaws, revolves the right-hand pilot to engage the die, which upon going the desired distance reverses the spindle, thus removing the die from the work. The pilot is carried back to its original position and in so doing again reverses the machine, throwing the clutch in the forward motion ready for the next piece.

In a recent test 460 ½-inch pipe ends were finished in an hour and forty minutes, and 1,660 ½-inch water bibbs, shanks and nose ends were completed in ten hours.

THE BIRMINGHAM BRASS TRADE: ITS HISTORY AND PROSPECTS.

By Our Special British Correspondent.

The great hardware city of Birmingham, Mid-England, has a wonderful conglomeration of industries, but it prides itself peculiarly on being the "home of the brass trade." There are at present some 600 houses, great and small, engaged in the trade, of which about 500 are brassfounders, and the industry finds employment for fully 40,000 men, women and children. Every development and invention in the way of domestic utility makes demands upon the brass trade, and though it has its seasons of depression and feels the influence of hostile tariffs, yet it continues to progress, and apparently will continue to do so in the future. The year just ended is authoritatively described as "the worst since 1879," that year being the most disastrous on record, and the out-of-work pay in connection with the men's union has never, with the exception of that single period, been heavier. Yet nobody can be found who regards this depression as other than temporary, and there are signs which manufacturers are optimistic enough to believe presage an unprecedented run of prosperity at no distant date. That very material changes are going on in the trade is very obvious, but these in the long run will probably tend to its increased vigor, while the development of the motor building trade, which is now going on in Birmingham by leaps and bounds, will prove a valuable feeder of the industry.

The brass trade has a most interesting history. The name of one of the firms—the "Battery Company," of Digbeth, itself one of the most ancient quarters of the city—recalls the time when brass was "battered" or beaten by smiths, long before drawing-mills had been dreamed of. The earliest company bearing this suggestive title seems to have been the Bristol Battery Company, established in the year 1700, but it was forty years later before the industry was imported into Birmingham, one Turner founding a brass-working concern in Coleshill street, then a quiet semi-rural suburb, but now in the heart of the city. His customers used to come many miles on horseback to purchase his wares, paying cash down out of their well-stocked saddle bags and sending their goods away in the four-horse carriers' van. Even in those primitive days the workmen made money, the local historian recording that they used to boast of their guinea a day, and I have known an apprentice earn for his master 15 shillings a day.

An enormous step forward was taken in 1769 with the opening of canals and the introduction of rolling by water-driven mills. About this time the Newcomen engine came to the aid of the trade, one of the first to employ it being the brothers Philip and Henry Muntz, whose successors are still owners of the establishment bearing their name and which has won world-wide fame. Further developments were due to the enterprise of Boulton and Watt, whose achievements are too well known to need further mention. Their share in the development of bronze and copper coinage and the subsequent growth of this branch of the industry would suffice for an article in itself.

The record of the Nineteenth Century is one of continuous progress. Between 1803 and 1847 the number of firms in the brass trade had increased from 72 to 182. But the even tenor of progress was disturbed by such irregularities as "copper rings," the "cornering" of the market being, it seems, a practice very well understood as far back as 1780. On one occasion the price was rushed from £74 to £84 per ton, and when a rival combination entered the field the monopolists ruined them by dropping the price to £56. The memorial of this scoop is the "Brasshouse passage," where the ill-fated Brass House formerly had its headquarters. The advent of the railway gave an impetus to tube-drawing, and the first seamless tube for locomotive boilers was made by Mr. Charles Green in 1838.

From this time forward the trade has gone on in Birmingham by leaps and bounds side by side with the development of gas, the growth of the bedstead industry and the advent of electricity. The latest claimant for brass tubes is the motor industry, which during the past two years has shown signs of making Birmingham a most important building center. In the event of an industrial revival the brass trade should have a great run.

Manufacturers agree that the trade at present is entering upon a new era, largely attributable to the development of the public taste. Ornamental brass work will, in future, be a different thing from what it has been in the past. There is now less demand for intricate decoration, forms cared for only by the uneducated. The educated classes are more particular about their outlines, which must be chaste. This is rather an advantage to the producer, since it is conducive to greater cheapness. Machinery is being introduced to an enormous extent and is displacing hand labor. Similarly, girls, wherever they can be profitably used, are displacing men. For the lighter forms of artistic work women are well qualified, and the men's union, while it views this state of affairs with great dissatisfaction, recognizes the uselessness of resistance. On the matter of artistic workmanship the local technical and art schools are beginning to tell in a very wholesome manner. Manufacturers speak with the highest appreciation of the ability of the younger generation of workers. The factories have a larger proportion of experts than they have ever had in the history of the trade. They work scientifically and show initiative in the development of novelties. On the manufacturers' side there is less prejudice and discouragement of initiative than formerly, and the sharp youth receives encouragement to use his wits. This is necessary, especially in these bad times when everybody is in search of something that will catch the public eye, and for which it is possible to create a taste. So many knick-knacks can be made in brass that the field of operation is practically endless.

Foreign competition is felt rather severely in certain directions, but it is remarkable that there is by no means unanimity in support of tariffs. When Mr. Chamberlain's proposals come to the vote, he will have scores of manufacturers voting against him. The president and chairman of the Brass Manufacturers' Association are tariff reformers, but an immense number of the rank and file are as keen for free trade as ever. The explanation is that the imports are restricted to certain cheap lines. One large manufacturer says he only suffers as far as brazed and half-brazed goods go. He holds his own perfectly in regard to articles of domestic utility generally. Foreign competition, this authority holds, plays a very unimportant part in the present depression, which he attributes rather to general slackness of demand at home

and abroad. Foreign competition, in fact, is hardly disturbing the equanimity of the Birmingham producer.

One of the sources of trouble is the rise in copper, which has greatly added to the cost of production, due, as one maker puts it, to "American speculation and stock-brokers' tricks." It is agreed that the rise is not due to any legitimate demand, a rise in materials in a time of depression being against all experience. The advance has caused a good deal of inconvenience.

Among the recent developments of the trade is a great demand for door furniture, such as knobs and panels, metal displacing wood and china, and this growth promises to continue. In certain kinds of lamps, too, a big trade is being done. Some makers claim to be doing a big trade with America in the best goods in this and other lines. A splendid colonial trade is being done, while scores of firms say that in spite of big tariffs they have no difficulty in getting their goods into several continental countries. Here, for example, is an extract from a trade notice of one of the largest houses: "Messrs. —— do not fear foreign competition. They do a very large brass foundry business in Australia, which in itself is a fairly large order, and whenever competition has appeared they have been able to meet it. Judging by the means they have at their disposal and the originality shown alike by the principals and their leading mechanics, there is no doubt that it will be a long time before they will need to call protective legislation to their aid." In builders' requisites certain firms say they have the trade in their hands.

One of the wonders of the trade is the enormous number of patterns. It is computed that the number approaches 400,000. One firm alone has 15,000 castings in constant use, besides a large number which are only wanted occasionally but which must be stored and classified. The number is, of course, constantly growing, and as the public taste alters and developes the number will grow more rapidly.

There are remarkably few labor troubles in the trade. The men have a very strong union, but on the whole the employers have little fault to find. The men, they say, are reasonable, and when an agreement is arrived at, the union furnishes a guarantee as to its being loyally and faithfully carried out. The principal complaint, however, is that a considerable number of small houses disregard the union and are thus able to use an undue proportion of woman labor or employ non-unionists, and are thus able to compete unfairly with the larger houses. This state of things is growing and, it is thought, will one day not very far distant force a crisis. In certain directions the union men themselves are victimized. This applies where an inefficient workman in one branch, say, a caster, turns out an inferior article. The man in the next department has to finish this off and correct its defects without extra remuneration. Probably if his confrère were not a union man he would strike, but being in the same combination he takes this manifest injustice uncomplainingly. One of the effects of the depression has come home with some severity upon the office clerk. Nearly all the routine clerk work is now done by women and girls. As the skilled workman was determined to get his pound of flesh under the powers of the union, the clerk has had to share with various labor-saving devices the brunt of the economies effected.

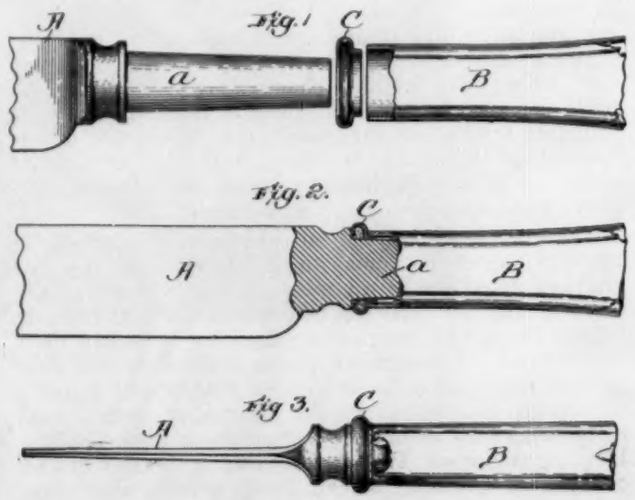
After laying for fifty years in Ballycotton Bay, Ireland, the steamship Sirius was recently raised and her fittings of brass, copper and gun metal converted into mementos. The Sirius was the first steamship of her kind to cross the Atlantic.

AN IMPROVED FORM OF TABLE KNIFE.

The reinforcement of the portions of plated ware which receive the most wear is a subject that has heretofore had much attention. In the case of spoons or forks, the underside of the bowl and handle, the parts upon which the most abrasion is received, have been treated by giving them extra plating or by soldering pieces of silver directly on the spot which it is desired to protect.

In the case of table knives, however, the problem has been a more difficult one to solve. The same trouble has always existed in table knives that is found in spoons and forks: the rapid wearing away of the exposed portions. In the case of a table knife the bolster receives an abnormal amount of abrasion on account of its unprotected position.

Geo. Brabrook, Esq., of the Reed & Barton Company, of Taunton, Mass., has invented a form of table knife which obviates the extra wear on the bolster. In the usual form of knife with a steel blade and hollow handle, he makes a bolster of sterling silver and interposes it between the handle and blade.



NEW TABLE KNIFE.

Referring to Fig. 1, the principle of the invention may readily be seen. "A" is the steel blade of a table knife made by forging in the usual manner. "A" is the shank of the blade which enters the handle. "B" is a hollow handle made in halves from German silver and soldered together with silver solder in the usual manner. "C" is the bolster made from sheet sterling silver by spinning or otherwise. This bolster is soldered on by means of silver solder between the blade and handle, as shown in Fig. 2, so that the finished knife has the appearance indicated in Fig. 3.

It will readily be seen that, inasmuch as the bolster is of solid metal, the abrasion will not affect it and a table knife produced which will have a wearing quality not obtained by the usual method of making this article.

A subscriber writes that "It is impossible to speak too highly of THE METAL INDUSTRY," he declaring that the journal combines faithfulness with the highest practical intelligence. The subscriber also reports that he has had twenty years' practical experience in England, and twenty years' practical experience in the United States.

NEW PROCESS FOR BLANCHING SILVER-COPPER ALLOYS.

When silver-copper alloys are annealed in order to facilitate their working, their surface becomes gray or black in consequence of the formation of oxide of copper. It is therefore necessary to subject them to a brightening process, a so-called blanching, which usually consists in heating them up and throwing them, while still hot, into a rotating tumbling barrel filled with a 5 per cent. solution of sulphuric acid. After the copper oxide has been dissolved and the surface has become bright again, they are removed into another vessel with water and cream of tartar and stirred, after which they are washed with water and then dried. For annealing the time required was 20 minutes, for the first tumbling 1 hour, for the total subsequent treatment another hour, a total of 2 hours and 20 minutes.

The above coating has been examined by Haagen-Smit (*Metallurgie*, vol. 1, page 189), who made the discovery that it is not only constituted of the higher oxide of copper, the cupric oxide, but also of the lower one, the cuprous oxide, and that it is the latter which is but very slowly attacked by sulphuric acid. The cupric oxide is black, while the cuprous oxide is bright red; at lower temperatures there are present from 70 to 90 per cent. of cuprous oxide and at higher temperatures up to 90 per cent. of cupric oxide. Basing his search on this discovery, Haagen-Smit set out to improve the process by introducing an oxidizing material into the bath, which would oxidize the lower oxide of copper into the higher oxide. He experimented with saltpeter, chlorate of potash, bichromate of potash, nitrite of potash, hydrogen peroxide, barium peroxide, peroxide of manganese and permanganate of potash. The latter was found the most effective. The process is carried out by treating 550 lbs. of black plates of 720 fineness with warm water, drawing the latter off and throwing them into a bath of about 15 cub. in. 66 Bé sulphuric acid in 7 pints of water. The latter solution has been previously made up in the tumbling barrel and has a temperature of 140° F. Even if the acid has a concentration of 10 per cent. and a temperature of 176° F., no appreciable amount of silver is dissolved; the temperature limits are also wide, inasmuch as the reaction is still very active at 86° F. The sulphuric acid quickly dissolves the oxide which covers the surface and gives the silver plates a bright red appearance; the solution only requires two minutes. After the process has reached this stage, about 4 oz. of permanganate of potash are added in quantities of about 1 oz. (in order to keep the concentration low). The time required for this manipulation is two minutes and the reaction is evident right away, as the plates become white, with the exception of a few, the surface of which is highly colored by peroxide of manganese or copper sulphate. The blanching is finished in three minutes, if sufficient permanganate of potash and sulphuric acid were present. The barrel is rotated for 2 to 3 minutes more, in order to be sure that all the cuprous oxide is dissolved.

Each fineness of the silver copper requires a certain quantity of permanganate and of sulphuric acid, which can easily be calculated. Attention has to be paid that an excess of permanganate of potash or a stronger acid than 10 per cent. is not used and that the temperature is not too high. The plates are then polished in a small tumbling barrel at 36 revolutions per minute by shaking them for 20 minutes with 7 oz. of cream of tartar. After this operation the surface of the plates is more or less polished, and the latter are ready for use after being dried in a steam pan. The total time required is less than one hour. Care must be taken to dry the plates thoroughly. It was also found that a mere tumbling with water for 3 to 5 minutes was sufficient for polishing purposes.

The process may be used in all cases where copper or other easily oxidizable metals are to be parted from gold and silver, f. i. for the working of so-called anode slimes, which are formed during the electrolytic refining of gold, silver or copper. It is not necessary any more to roast the slimes repeatedly, but the extraction can be performed by a somewhat concentrated solution of permanganate of potash and sulphuric acid at low temperature. Finely divided copper does not resist the action of permanganate, and even if it is compact it is very quickly brought into solution at increased temperature (212° F.).

The new blanching process is also of importance for the gold and silver industry, inasmuch as it is possible to quickly blanch an object, without previous heating or boiling, in a simple manner and at a temperature of 122 to 212° F. The fineness is also increased. A saturated permanganate solution should be used for this purpose, with a maximum of 10 per cent. sulphuric acid and it should be contained in a stone ware or porcelain dish. A strip of coin silver of 717 fineness, rubbed off and dipped into such a bath for a few minutes showed a beautiful white color, all the copper having been dissolved from the surface.

MELTING TEMPERATURES OF THE COMMON METALS.

The melting points of metals have been a subject of considerable controversy in spite of the many investigators. That there should be discrepancies in the determinations, and especially among the earlier ones, is not surprising, considering the difficulties of high temperature measurements as such and the more or less crude methods and instruments used. Progress in high temperature measurement, important though it be in metallurgical operations, is of comparatively recent date, and in no small degree due to the recognition of the importance of a definite heat treatment upon the structure and consequently the mechanical properties of metallic products. Modern melting point determinations, made with more accurate instruments, are therefore more trustworthy than the older ones.

In answer to various inquiries concerning this point, we give in the following the melting points of the common metals as given by J. Castell Evans in his Physico-Chemical Tables, where the values found by the different investigators are arranged in chronological order, showing the considerable variations arrived at. In the case of copper for instance, the lowest determination is 950° centigrade and the highest 1,330° centigrade. The following values are considered by him the most reliable: Copper, 1050° centigrade (1922° Fahrenheit); zinc, 433° C. (811.4° F.); lead, 326.2° C. (619° F.); tin, 232° C. (449.6° F.); aluminum, 625° C. (1157° F.); bismuth, 268.3° C. (514.9° F.); antimony, 632° C. (1169.6° F.); nickel, 1450° C. (2642° F.); platinum, 1775° C. (3226° F.); manganese, 1900° C. (3452° F.); silver, 968° C. (1774.4° F.); gold, 1050° C. (1922° F.).

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A subscriber wants to know how to test his solution for cyanide and if he can test for cyanide and silver with one test.

A.—We suppose your question refers rather to the practical testing of working silver cyanide solutions than to the determination of the cyanide by chemical analysis. The latter, of course, can only be performed by a trained chemist, as it involves a knowledge of the operations of quantitative chemical analysis. It is, however, possible to determine by the state of your silver anodes whether your bath is too rich or too poor in cyanide. If the anodes do not loose the gray-brownish color they assume when the bath is working, within a short time after stopping and become white, the bath is too poor in cyanide and should be replenished, a little being added at a time, until the anodes behave normally. On the other hand, if the anodes remain white when the bath is working, there is more cyanide present than is necessary, and a little of the silver compound used should be added. The amount of silver in the bath can only be accurately determined by chemical analysis, by precipitating a measured amount of the solution with hydrochloric acid. This involves a number of precautions for its success. It is possible, however to judge when the solution is too poor in silver, inasmuch as the anode is then apt to cover itself with a blackish deposit. When this occurs, it is a sign that the bath needs replenishing with silver.

Q.—A subscriber asks for information as to how to make cyanide of nickel solution and to deposit the nickel on any kind of articles.

A.—It is not difficult to make cyanide of nickel solution, inasmuch as the ordinary single nickel salt solution can be used and the nickel precipitated by the addition of potassium cyanide solution. The addition has to be continued with stirring until the precipitate dissolves again. The solution has been used for depositing nickel for the purpose of determining it in chemical analysis by electrolysis, an addition of a small excess of potassium cyanide and some ammonium carbonate being recommended. We are not aware that the solution is used for practical purposes by electroplaters, as it has not even given good results in the laboratory as far as the quality of the deposit is concerned.

Q.—A subscriber wants to obtain information in regard to a newly invented method of plating on glass, so that the deposit will only cover certain parts.

A.—We refer you to the illustrated description of a recent process, published at another place in this issue.

Q.—A brass founder has trouble with some small yellow brass plates, part of which were dipped right after cooling and behaved all right. The other part were dipped 20 days afterwards and showed black spots which cannot be taken off unless scratch brushed, which changes the color.

A.—It is difficult to determine what your trouble is, inasmuch as the first batch came out all right after dipping. The mixture which you give contains a rather high amount of lead, more than has been recommended for use in such mixtures, and that may be the source of the trouble. In that connection you might consult the answer given to a similar inquiry in THE METAL INDUSTRY, November, 1903, page 167. Perhaps there might also have been a variation in the strength of your dip between the first time it was used and the second time, as a nearly exhausted dip is apt to produce blackish patches.

Q.—A French subscriber asks for a process for removing tin from scrap.

A.—Various processes have been mentioned from time to time in THE METAL INDUSTRY. A Danish process, which is reported to have been used for some time in Copenhagen, depends upon the solution of the tin by a stannic chloride solution containing about 2 per cent. of tin. The solution passes through a series of tanks in succession and then goes into the vats, where it is split up by electrolysis into tin and chlorine. The tin precipitated upon the cathode falls down to the bottom of the cell, while the chlorine liberated at the anode converts the stannous chloride there into stannic chloride, thus exerting the opposite reaction from what took place in the solution vats and regenerating the dissolving solution, which goes back again to the leaching tanks. No ferric chloride is stated to be found during electrolysis, when the quantity of tin is sufficiently great.

Q.—A brass founder asks for a flux which will reduce the oxide on a mixture of one pound aluminum to six pounds zinc. He has tried borax, which does not work, as the melting point of the mixture is too low and sal ammoniac burns away too rapidly.

A.—The temperature of your metal is too low for the usual fluxes and there is no flux that we know of that will do the work at that temperature. If you could get the temperature high enough to melt fluorspar or cryolite, they would probably prove satisfactory, but you would run the danger of incurring the disadvantages incident to that high temperature. Sal ammoniac will not fill the bill as a flux in your case, as you want something which will dissolve the alumina which forms by oxidation of the metal. Sal ammoniac will not do this.

Q.—A plater wants the antidote for cyanide poisoning, given in our November issue, in a more simple form, so as to be sure as to have it put up right by the druggist. He also wants information as to where he can find a description of the Royal copper finish.

A.—Ten cubic centimeters in the metric system are equivalent to .338 fluid ounces, consequently the 30 cubic centimeters of the ferrous sulphate solution equal 1.014 fluid ounce, which is the quantity to be taken for one dose. The same amount of the caustic potash solution is taken for one dose. Your druggist knows how to make up a 23 per cent. solution of ferrous sulphate as well as a 5 per cent. solution of caustic potash. The amount necessary for one dose should be put in a small bottle, the bottle for the ferrous sulphate solution being of a different color from that for the potash solution. One set of the antidote, therefore, consists of a small bottle of ferrous sulphate, a small bottle of caustic potash and 30.86 grains of light, powdered magnesia in a small package. Several sets may of course be made up, but each set should be kept separate, so as to avoid even the remotest possibility of a mistake being made in administering the antidote on account of the seriousness of the matter.

The Royal copper finish has been described in detail in the February, 1903, issue of THE METAL INDUSTRY.

Briefly recapitulated, it consists of polishing the article to be treated, then cleaning it in a hot potash bath and rinsing it well, after which it is plated with a thin coating of lead in a solution composed of 5 parts of litharge and 50 parts of caustic potash in 1,000 parts of water. After a uniform coating is obtained, the article is rinsed, dried and heated red hot by means of a blowpipe. It is then allowed to cool and polished on a rag wheel with rouge, and the red color appears by this operation.

Q.—A plater asks for a stop-off paint for spot gilding.

A.—A black asphaltum paint made from asphaltum and beeswax, dissolved in turpentine has been recommended for the purpose. Two parts of asphaltum and one part of beeswax should be taken and only enough turpentine used to get the solution to the consistency of a thin paint. Cold gilding solutions are preferably used, as the paint is liable to be attacked by hot solutions when the articles are left too long in them. After gilding the paint is removed by dipping the work into turpentine.

JAPANESE WHITE METAL.

THE METAL INDUSTRY recently made an analysis of a Japanese white metal tray and the result was as follows:

Lead, 96.6 per cent.
Antimony, 3.4 per cent.
Copper, slight trace.
Tin, slight trace.

The tray was scarcely one-sixteenth of an inch in thickness, but the design was brought in sharp relief and plated with gold and silver. We are informed by a Japanese metallurgist that such trays are usually cast in Japan in paper molds, the low melting temperature of the alloy permitting a casting to be made in a mold of this material.

ALUMINUM INSTRUMENTS OF PRECISION.

A model factory for the manufacture of instruments of precision is that of C. L. Berger & Sons, of Boston, Mass. This firm has manufactured engineering instruments for many years, and their shop was formerly located in Province Court, in the center of the business district. During the past two years they built a factory in the South end of Boston, of the slow burning mill construction, part of it fireproof, and have equipped it with the latest tools and appliances. The improvement over the old shop in Province Court is most marked.

During the past six years the firm has found a growing demand for aluminum instruments, and is using the metal when suitable. It now manufactures a number of them in which the metal is partly aluminum, and others where almost the whole of the instrument is made of light metal. Aluminum is specified particularly for the instruments of the United States Coast and Geodetic Survey, and the results have been satisfactory. The firm recently completed their 5,000th instrument, which event was celebrated by the employees in presenting a laurel wreath to the firm.

An aluminum novelty which is being put on the market by Sidney Shepard & Co., of Buffalo, N. Y., is a magic tooth pick holder. The holder is weighted in the bottom and therefore always rights itself when tipped over. It is reported to be a good ten cent selling specialty.

READERS' OPINIONS.

Correspondence is solicited from all of our readers on subjects relating to the founding, finishing, rolling and plating of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address THE METAL INDUSTRY, 61 Beekman street, New York.

LIGHT YELLOW BRASS CASTINGS.

To the Editor of THE METAL INDUSTRY:

It is a notable fact that few articles appear in metallurgical journals containing practical information concerning the molding and casting of light, yellow brass castings. By a light casting we mean one that will cover a surface, say, two by four inches and weigh an ounce or even less. Many a molder who is capable of "holding his own," on the general run of work, either on the bench or side floor, has failed ingloriously to run over 20 per cent. of his castings on this class of work.

It is often amusing to an experienced observer to note the expression on the face of a man of this description when he shakes out his castings after pouring his first heat. The general air of assurance, not unmixed with contempt for such "chicken feed," has changed to surprise. After pouring his second heat, assurance entirely disappears, and before the day is done he will either be completely rattled and quit or ask the foreman "what did it."

There seems to be a difference of opinion as to the amount of ramming the sand requires to obtain best results.

If the mold is poured on end the sand should be well pened and rammed hard over the gate and across the bottom of both nowel and cope. After the pattern has been carefully drawn the mold is sure to contain a firm, sharp impression of the lines and figured work on the pattern and the possibility of fins and swell castings is very remote. The clamp in this case may be adjusted loosely, as the mold is capable of resisting the pressure of the metal to a great extent.

Some molders insist that a soft mold is best, but results have proved the contrary, provided the metal has been properly melted and poured.

In melting, if scrap is used, and it must be used to meet the close competition of the present day (in fact, the intelligent foundryman prefers it), care must be taken as with new stock and it must not be overheated. Just previous to removing the crucible from the furnace, the necessary amount of spelter should be added, thoroughly stirred, and the metal allowed to "boil" for a few minutes. By following this method it is not necessary to pour the metal "jumping" hot in order to fill the mold with a sound, smooth casting. In some foundries a small quantity of aluminum is added to increase the fluidity of the metal, but this means more cost without a proportionate return.

The foregoing is the result of observations covering a period of eighteen years of varied bench molding, but it is to be hoped that others of less, as well as of greater, experience will have something to say along this line, to the mutual interest and benefit of all concerned.

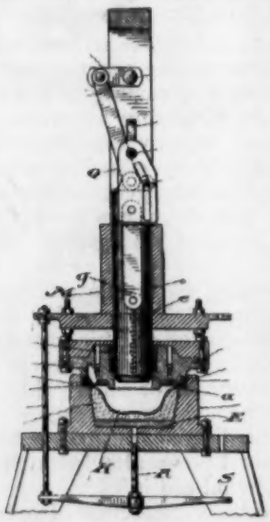
A. L. BARLOW.

Robert J. Hubbard, a director of the Rome Brass & Copper Company, the Rome Tube Works and the Rome Metal Company, of Rome, N. Y., died on December 19th at Cazenovia, N. Y., age 74 years.

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

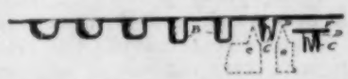
772,940. Oct. 25, 1904. APPARATUS FOR SHAPING HOLLOW METAL WARE. James Humphrey, Toronto, Canada.—In apparatus for shaping hollow metal ware, a die provided with a flange surrounding a laterally-extending shoulder; a cover; an annular plate held at the under side of the cover so as to have a slight vertical motion and adapted to engage the shoulder and fitting



within the flange; and a ring of packing located between the plate and cover, in combination with a reciprocating plunger working through the cover and adapted to enter the die; means for causing the cover to descend to force the annular plate into contact with the aforesaid shoulder; and means for subsequently projecting the plunger into the die.

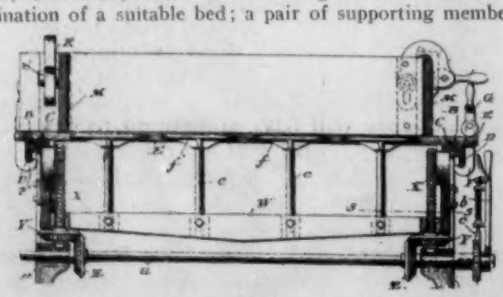
773,450. Oct. 25, 1904. PROCESS OF MAKING ALLOYS. Robert S. Anderson, Seattle, Wash.—The process of producing an alloy which consists in mixing copper and tin in about the proportion of ninety-three pounds of copper to seven pounds of tin and heating the same until they are brought into a molten mass, adding copper sulphate and finally adding aluminum, in about the proportion of two pounds of aluminum to five ounces of copper sulphate and pouring off the same and allowing it to cool in the form of mats or pigs.

773,658. Nov. 1, 1904. MAKING METAL BUTTONS. John D. Lord and Philip P. Cooke, Jersey City, N. J.—The method of making sheet-metal buttons, consisting in successively drawing



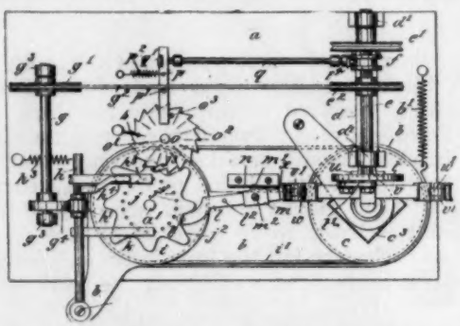
a thimble on a piece of sheet metal, cutting out parts of the sides of said thimble, to form prongs projecting from the sheet-metal thimble and then cutting out a circular piece of the sheet-metal plate around and concentric with said pronged thimble.

777,445. Dec. 13, 1904. MOLDING-MACHINE. Edward L. Stevenson, Cincinnati, Ohio.—The molding-machine consists of the combination of a suitable bed; a pair of supporting members ad-



justably mounted thereon; mold sides secured upon said supporting members and adjustable lengthwise thereon; and mold ends adjustably and securely connected to said mold sides.

777,626. Dec. 13, 1904. MACHINE FOR BEATING LEAF METAL. Hans E. Grabau, Hoboken, N. J.—The construction of the machine shows the combination of an oscillating frame with a work-holder arranged at the free end of the frame, a pulley operatively connected to the work-holder, a cam-disk secured to the pulley,



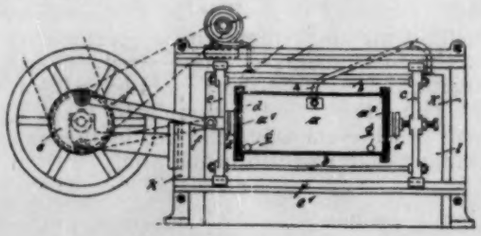
a cam-lever engaging the working periphery of the cam-disk and adapted to oscillate the frame and work-holder, a fixed abutment against which the cam-lever is adapted to act, pins on the cam-disk, a feed-dog adapted to engage the pins, a lever carrying the feed-dog, and means for oscillating the lever.

776,737. Dec. 6, 1904. MANUFACTURING SCREW-THREADED PIPES, TUBES, OR RODS. Edwin T. Greenfield, Monticello, N. Y.—This process of manufacturing a screw-threaded pipe, tube, or rod, consists in embedding a brazing material and a flux in the outer surface of the articles to be treated in one or more longitudinal grooves. Metal thread is then wound around and the entire mass is heated until the brazing material fuses. The articles are then allowed to cool.

776,952. Dec. 6, 1904. PROCESS OF SECURING METAL COVERINGS UPON PIPES. Richard V. Skowronek, Zwickau, Germany.—The process of combining metal pipes melting at a high temperature with a lining of metal melting at a lower temperature, consists in forming a galvanoplastic deposit upon the surface to be covered, then applying against said surface the lining in the shape of a pipe, then placing the whole vertically in a mold adapted to inclose the lining metal fully and snugly and prevent it from leaking out when fused, then placing the mold vertically in an oven and heating it with the pipes sufficiently so as to fully melt the metal forming the lining, then allowing to cool and finally removing the mold.

777,546. Dec. 13, 1904. PROCESS OF BRAZING. Leigh Roy Schaap, Loveland, Colo.—The process of brazing consists in raising the parts to be united to a suitable temperature, and applying yellow prussiate of potash, plaster-of-paris, charcoal, citric acid and borax thereto in suitable proportions and finally applying the brazing metal.

778,510. Dec. 27, 1904. APPARATUS FOR REDUCING BRONZE TO POWDER. George E. Schmidmer, Nuremberg, Germany.—The apparatus for producing bronze powder consists of the combination of non-rotary receptacles *a* inclosing metal shavings to be treated



and also metallic bodies *g*, supporting means for the non-rotary receptacles, of an eccentric *e* on a driving-shaft *e'* connected to the receptacles by a rod *f* and causing the former to reciprocate rapidly, whereby the metallic bodies are thrown against the bottoms of the receptacles and fly back therefrom, thus efficiently treating by impact solely the metal shavings in the receptacles.

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

A new Newark, N. J., jobbing brass foundry is that of Alexander Henderson, 73 Hamilton street.

The Pittsburg Gage & Supply Company, of Pittsburg, Pa., have issued a folder showing a sectional view of the Pittsburg vacuum exhaust head.

A circular giving an illustration and description of the Blaisdell 20-inch special high speed lathe is being issued by P. Blaisdell & Co., of Worcester, Mass.

The Florence Manufacturing Company, of Florence, Mass., expect to offer some very startling novelties in the way of aluminum toilet brushes, etc., for 1905.

G. Lapides, a wholesale metal dealer of New Haven, Conn., is building a new shop at Commerce and Temple streets. When completed he will smelt white metals.

The Niagara Machine & Tool Works, of Buffalo, N. Y., have bought the patterns and manufactured stock of the West Manufacturing Company of the same city.

The W. D. Allen Manufacturing Company, of Chicago, Ill., are issuing a folder showing their various line of brass goods of grease and oil cups and hose couplings.

The Westinghouse Electric Manufacturing Company, of Pittsburg, have just installed two large metal separators made by the Dings Electro-Magnetic Separator Company.

During the customary holiday shut down, The Howe Scale Company, of Rutland, Vt., installed a steam and air compressing plant in a new addition they have built to their factory.

The Waterbury Brass Company, of Waterbury, Conn., are making a number of minor improvements in their rolling mill, which will give them greater facilities for handling material.

The new enlarged buildings of The Ferracute Machine Company, at Bridgeton, N. J., are completed, and the company expects to have the machinery and equipment installed in January.

The Norwich Nickel & Brass Company, of Norwich, Conn., have been awarded a gold medal for their metal window display fixtures which were shown at the Louisiana Purchase Exposition.

P. J. Donovan, who operated a brass foundry at 249 Railroad avenue, Bridgeport, Conn., for thirty years, died December 16, 1904. His business is at present being conducted by his son Edward T. Donovan.

The New Jersey Zinc Company, which operates a number of spelter and zinc oxide plants, will erect a large new works at Depue, Ill. The works will be able at the start to reduce 75 tons of ore per day.

The St. Charles Brass Manufacturing Company, Elgin, Ill., have changed their title to the Elgin Brass & Electrical Manufacturing Company. The officers are: E. W. Lawson, president, and F. A. Ziegler, secretary and treasurer.

The Riverside Metal Refining Company, Connellsville, Pa., are issuing from time to time a pamphlet entitled "Ingot." It contains information about the use of scrap metals and is also used for advertising the Riverside Metal Refining Company.

The Torrington Manufacturing Company, of Torrington, Conn., make a specialty of machine building of any description either from the designs of customers or from their own. Confidential work is solicited and privacy and accuracy is guaranteed.

The Frictionless Metal Company, Richmond, Va., report that they are not going to build a branch plant at Knoxville, Tenn., as reported, but are figuring on building a branch works at Chattanooga, Tenn. The company manufacture frictionless metals.

S. Sternau & Co., 195 Plymouth street, Brooklyn, N. Y., manufacturers of metal wares in brass, copper and silver, have rented premises at Bridge and John streets, adjoining their present factory. This addition will double the manufacturing facilities of the firm.

S. R. Slaymaker, the large lock manufacturer of Lancaster, Pa., has bought the entire business, machinery, patterns, tools, contracts, records, etc., of the Thomas Slaight Lock & Manufacturing Company, of Newark, N. J. The Slaight goods in the future will be manufactured at Lancaster.

Two small articles manufactured by The Carborundum Company, Niagara Falls, N. Y., are rub stones and polishing wheel dressers. The rub stones are used in the place of the ordinary whet stone and the wheel dresser for removing emery and glue from polishing and buffing wheels without the use of water.

Robert J. Taylor, Incorporated, manufacturers of black lead crucibles, Philadelphia, Pa., issue a neat folder stating what they make in the way of crucibles and also giving the crucible sizes, capacities and prices. They manufacture crucibles for melting brass, copper, aluminum, nickel, silver, gold and bronze.

The McCullough-Dalzell Crucible Company, of Pittsburg, Pa., have issued a 1905 calendar on which is printed an illustration of their works located alongside the Allegheny Valley Railroad at Pittsburg, Pa. The McCullough-Dalzell Crucible Company manufacture crucible stoppers, and all articles containing plumbago.

C. W. Moore, of 39 E. Washington street, Bridgeport, Conn., announces that he pays the highest market rates for scrap copper composition and brass turnings, also grindings, sweepings, drosses and skimmings. Mr. Moore reports a good trade for metals and the prospects are even better with the opening of the New Year.

Louis Schulte, a practical plater of 47 Cedar street, Brooklyn, N. Y., announces that he sells formulas and practical working methods in plating processes, also furnishes plants for polishing and plating sheet metal band iron wire, etc. Mr. Schulte reports that he owns several patents which are useful in the plating industry.

The Buckeye Aluminum Company, of Doylestown, Ohio, report that they have had a very busy year, and for the last month have been working day and night. Their business is growing steadily, and they expect to engage additional help throughout 1905. The company reports a good demand for high grade aluminum cooking utensils.

The Genesee Metal Works, of Rochester, N. Y., report that the year just closed has been very successful for them in all of their lines. Their phosphor tin sales alone have been sufficient to produce over 2 000,000 of standard phosphor bronze castings. Mr. F. W. Reidenbach who is superintendent, believes that in 1905 their business will double.

Mr. Frank H. Davol and John J. Williams have announced that the copartnership of John Davol & Sons, metal dealers at 100 William street, New York, expired December 31, 1904, and that by mutual consent the business would be discontinued after

that date. The firm of John Davol & Sons was one of the oldest in the metal business in New York City.

The Brown & Sharpe Manufacturing Company, of Providence, R. I., have taken the grand prize at the St. Louis Fair for their exhibit of fine tools. Their new six story building adjoining their present plant is nearing completion, and they expect to move in by March first. Other enlargements are under contemplation, which will be started in the Spring.

Dings Electro-Magnetic Separator Company, of Milwaukee, report a very substantial gain in their business for 1904 over any former year, and will start in the new year with sufficient orders on hand to keep them busy for some time to come. Their new high-efficiency separators for use in concentrating ore is attracting considerable attention in the zinc districts.

John C. Culbert, of 22 Beech street, Pawtucket, R. I., announces that he is in the market for from 100 to 300,000 pounds per month of brass grindings, sweepings, composition buffings, tailings, brass pin shot, solder dross, tin dross, lead dross and genuine babbitt dross. Mr. Culbert reports that he pays spot cash for this material, and asks no credit no matter what the quantity.

The Buffalo Gas Fixture Company, of Buffalo, N. Y., have been incorporated under the laws of New York, with capital stock of $10,000. J. M. Erlich, of New York City, is president and treasurer; George A. Bowden, vice-president, and Marc W. Comstock, director. The Buffalo store is now under the management of A. N. Burnham, with head offices at 109 Leonard street, New York City.

The business of M. Olderman & Son, refiners and dealers in metals of Ansonia, Conn., has been incorporated as The Ansonia Smelting & Metal Company, with a capital stock of $33,000 all paid in, $20,000 in cash and $13,000 in land on which the plant is located, merchandise, machinery and tools. Their business is the smelting and refining of all kinds of metals. Wm. Olderman is president and L. E. Wolff secretary.

The Aluminum Cooking Utensil Company, of Pittsburg, Pa., expect to increase their line of utensils in 1905, particularly those which are suitable for the hotel trade. At the present time the company is selling a line of hotel saucepans stamped from sheet aluminum 3-16 inch thick, which is considerably thicker than the usual stamped ware for this purpose. Hotel saucepans as a rule have been cast.

Some changes in the management of New England foundries are: Lewis F. Patterson has resigned as foreman of A. Carpenter & Sons Foundry, Providence, R. I., to take charge of the United Shoe Machine Company's new foundry at Beverly, Mass. R. H. Palmer, formerly foreman of Clark Brothers' Foundry, of Belmont, N. J., has taken charge of The Perkins Machine Company's foundry at Warren, Mass.

The New Jersey Aluminum Company, of Newark, N. J., have been awarded two silver medals at the Louisiana Purchase Exposition for their aluminum castings and novelties. The company report that 1904 will be their banner year, as they increased their sales about one-fifth over any previous year. The company are getting out new catalogues in which they will illustrate a lot of new articles for the general fancy goods and advertising novelty trades.

The Ajax Metal Company have recently closed negotiations in Canada and France for the manufacture of their plastic bronze and other of their patented products. The Canada plant is to be situated at Montreal, and the French plant at Paris, to be known respectively as the Ajax Metal Company of Canada and the Ajax Metal Company of France. The Ajax Company are extremely busy at their American plants located in Philadelphia, Pa., and Birmingham, Ala.

Owing to their increased business The Bristol Specialty Company, of Bristol, Conn., manufacturers of articles in metal ware, have decided to move their business to larger quarters and will probably locate in Terryville, Conn., on the site of W. H. Scott & Co.'s burnt out factory. A new factory of brick and stone will be built. The company have recently increased their capital, and E. L. Carrington, formerly of the American Silver Company, has been elected secretary.

The Aluminum Manufacturing Company, of Two Rivers, Wis., report that their business during the past year has been very good and the prospects in the aluminum industry seem to be as bright as ever. The company finds it necessary to constantly place new goods on the market, and in a single year they have made upwards of fifty new articles. This requires an immense amount of die and experimental tool work, but the company have to make this outlay in order to keep abreast of the times.

The National Sheet Metal Company, of Peru, Ill., report that they have increased their capital stock from $35,000 to $60,000, and have also increased the capacity of their factory, making it the largest and best for the manufacture of plated sheet metals. Last year their output was 600,000 pounds of metal, and this year they expect to manufacture 1,000,000 pounds. Their products include plated metals called nickelzinc, nickeltin, brass zinc, brasstin, copperzinc, coppertin, bronzezinc, bronzetin.

The Metal Manufacturers' Supply Company is the title of a new concern which has been established at 626 Cherry street, Philadelphia, Pa., for the sale of polishers' and metal workers' supplies. The company have several sole agencies for material, among them the plating dynamos made by Chas. J. Bogue, of New York City. The supply company has been formed by Raymond J. Fries, formerly with the Zucker, Levett & Loeb Company, and Thomas J. Ryan, who was with the Lackey, Hopkins & Perkins Company.

The Charles E. Sholes Company have moved from their offices at 25 Broad street, New York City, to 164 Front street, where they will occupy the entire building. The company manufacture chemicals for use in the working of metals, and have recently bought a large part of the laboratory apparatus which was exhibited by the German Government at the St. Louis Fair. The company have established The Industrial Laboratories with which they will make research, analytical or experimental work for industrial concerns.

Richards & Co., metal dealers, Boston, Mass., will move in January to the corner of Causeway and Beverly streets, where they will occupy the first floor and basement, giving them more floor space than they have in their present six-story building, as well as having the advantage of storing all their stock on the two lower floors. The firm of Richards & Co. are the oldest in the city of Boston, doing business under the original name and have sold metals in the immediate neighborhood of their present and future quarters since the year 1812.

A NEW LACQUER WORKS.

The Celluloid Zapon Company, manufacturers of metal lacquers, are now installed in their new plant in Stamford, Conn., and report that they have a modern lacquer factory in every respect. The buildings are of heavy brick construction, erected on concrete foundations with hard wood floors, lighted throughout by electricity. The total floor space is 63,000 square feet. The main building is 255 x 55 feet, equipped with three elevators and supplied with every convenience for handling materials. The other buildings, eight in number, include power plant, cotton house, distillation plant, dry house, chemical laboratory and warehouses. The company report that they are fortunately situated in having 800 feet of water front and 150 foot dock. A capable staff of experienced men, including four chemists, are employed.

PATENT FOR SALE.—Rights to manufacture pipe couplings. Requires no soldering and is cheaper and better. Absolutely tight joint. A valuable patent for manufacturers of brass water goods. Address, PATENT, care of THE METAL INDUSTRY.

POSITION WANTED.—By a plater with twenty years' experience, up-to-date on all solutions and colors. First class references. Address, PLATER, care of THE METAL INDUSTRY.

Metal Prices, January 10, 1905

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malacca	29.40
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	15.40
Electrolytic	15.25
Casting	15.00
SPELTER—Duty 1½c. per lb.	
Western	6.20
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.65
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	8.90
Hallets	9.15
Other	8.50
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.61
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	42.00

Zinc—Duty, Sheet, 2c. per lb. 600-lb. casks, 7.75 per lb., open, 8.25 per lb.

Tobin Bronze—Rods, Unfinished, 18c.

Tobin Bronze—Rods, Finished, 19c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16 to 17c.
Phosphor Bronze, Ingots	16 to 20c.
Silicon-Copper, Ingots	32 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	13.25c.	14.00c.
Copper Wire	13.00c.	13.25c.
Light Copper	11.75c.	12.50c.
Heavy Mach. Comp.	11.25c.	12.00c.
Heavy Brass	8.25c.	8.75c.
Light Brass	7.00c.	7.25c.
No. 1 Yellow Brass Turnings	8.00c.	8.50c.
No. 1 Comp. Turnings	9.50c.	10.50c.
Heavy Lead	4.25c.	4.50c.
Zinc Scrap	4.40c.	4.60c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	12.00c.	18.00c.
Old Nickel	15.00c.	25.00c.
No. 1 Pewter	20.00c.	21.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 12¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, January 10, 1905

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb. .... 23c.
Lighter than 10 oz. .... 29c.
10 oz. and up to 12 oz. .... 26c.
12 oz. and up to 14 oz. to square foot, per lb. .... 24c.
Circles less than 8 in. diam., 2c. per lb. addiCopper Bottoms.
Circles over 13 in. diam. are not classed as tional.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.........	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.........	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.28
Above No. 10 to No. 16.........	.23½	.27½	.28½
Nos. 17 and 18.........	.24	.28	.32
" 19 and 20.........	.25	.29	.33
No. 21.........	.26	.30	.34
" 22.........	.27	.31	.35
" 23.........	.28	.32	.36
" 24.........	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 35 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.
For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size......	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb........	28	[illegible]	22	21	20	20	20	20	20	20	20	21	22	24	26	27

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

				Per lb
Plain Round Tube,	¾ in. up to 2 in.,	to No. 19,	inc.	$0 35
" " "	⅝ " " ¾ "	" 19,	"	36
" " "	½ " " ⅝ "	" 19,	"	38
" " "	⅜ " " ½ "	" 19,	"	41
" " "	5/16 " " ⅜ "	" 19,	"	48
" " "	¼ " " 5/16 "	" 19,	"	65
" " "	3/16 " " ¼ "	" 19,	"	1 00
" " "	⅛ " " 3/16 "	" 19,	"	1 50
Smaller than ⅛ inch.........				Special
2 inch to 3 inch, to No. 19, inclusive.........				38
3 inch.........				40
Over 3 inch to 3½ inch.........				45
Over 3½ inch.........				56

Bronze and copper advance 3 cents. Discount 35 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.
Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than... And Including...	*3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier..	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 14.........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 15.........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	7
" 16.........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	8
" 17.........	......	42	44	44	44	44	47	47	47	48	48	49	50	3	9
" 18.........	......	42	41	44	44	44	47	47	50	51	51	54	57	3	10
" 19.........	......	42	44	44	44	41	47	48	51	52	52	56	59	4	11
" 20.........	42	44	44	44	44	46	49	50	52	53	53	58	61	4	12
" 21.........	42	46	46	46	46	48	51	52	58	59	62	65	......	5	14
" 22.........	42	46	46	46	48	48	51	55	59	61	64	......	......	5	16
" 23.........	42	46	46	46	48	48	51	57	60	64	......	......	......	6	18
" 24.........	42	46	48	50	50	50	53	59	62	......	......	......	......	6	20
" 25.........	44	47	49	51	51	51	54	61	......	......	......	......	......	7	23
" 26.........	44	47	50	54	54	54	59	......	......	......	......	......	......	8	25
" 27.........	44	48	52	56	56	57	62	......	......	......	......	......	......	10	28
" 28.........	44	48	54	56	57	57	64	......	......	......	......	......	......	11	32
" 29.........	46	49	56	58	60	60	69	......	......	......	......	......	......	13	36
" 30.........	46	50	58	60	64	70	77	......	......	......	......	......	......	15	40
" 31.........	48	52	60	63	68	76	......	......	......	......	......	......	......	17	44
" 32.........	50	54	62	66	74	82	......	......	......	......	......	......	......	19	50
" 33.........	52	56	......	......	......	......	......	......	......	......	......	......	......	21	57
" 34.........	55	60	......	......	......	......	......	......	......	......	......	......	......	25	66
" 35 & 36.........	1 67	Not wider than 6 in.	......	......	......	......	......	......	......	......	......	......	......	Polished two sides double above prices.	Satin Finish two sides double above prices.
" 37 & 38.........	1 98		......	......	......	......	......	......	......	......	......	......	......		
" 39 & 40.........	2 22		......	......	......	......	......	......	......	......	......	......	......		
" .008" to .0015"..	2 42		......	......	......	......	......	......	......	......	......	......	......		
Less than .0015"..	2 66		......	......	......	......	......	......	......	......	......	......	......		

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds.........10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.		Outside Diameter in Inches.
1-4......	......	......	......	10	9	8	7		1-4
5-16......	......	......	......	11	9	8	7		5-16
3-8......	......	......	......	12	9	8	7		3-8
1-2......	......	......	17	14	11	9	8		1-2
5-8......	......	......	21	16	13	12	......		5-8
3-4......	......	......	25	19	16	14	......		3-4
7-8......	......	......	28	22	18	16	......		7-8
1.........	......	......	30	25	21	19	......		......1 00
1 1-4......	......	......	36	30	25	......	......		......1 1-4
1 1-2......	......	52	43	35	28	......	......		......1 1-2
1 3-4......	......	60	50	41	33	......	......		......1 3-4
2.........	84	68	58	47	37	......	......		......2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.